GEM-10

SAFETY PROCEDURE MANUAL FOR USE WITH NUCLEAR MOISTURE-DENSITY GAUGES

GEOTECHNICAL ENGINEERING MANUAL
GEM-10
Revision #2

AUGUST 2015

NEW YORK STATE OF OPPORTUNITY. Department of Transportation | Office of Technical Services | Geotechnical Engineering Bureau

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SAFETY PROCEDURE MANUAL FOR USE WITH NUCLEAR MOISTURE-DENSITY GAUGES

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STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL ENGINEERING BUREAU

AUGUST 2015

SCOPE

This manual describes the operational safety procedures to be followed when using Nuclear Moisture – Density Gauges under the control of the Geotechnical Engineering Bureau, New York State Department of Transportation. This manual must be used in conjunction with the appropriate Departmental publication in effect, regarding soil testing when using a Nuclear Moisture – Density Gauge.

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OPERATIONAL AND SAFETY PROECEDURES TO BE FOLLOWED WHEN USING NUCLEAR MOISTURE-DENSITY GAUGE

I. FIRM LOCATION

A. Address

New York State Department of Transportation
Geotechnical Engineering Bureau
50 Wolf Road
Albany, NY 12232
Attention: Radiation Safety Officer, DOT Laboratories

Soils Engineering Laboratory Supervisor
New York State Dept. of Transportation
1220 Washington Ave., 7-107
Albany NY 12206
Phone: 518-457-4735
Fax: 518-457-0395

Mailing Address:
New York State Department of Transportation
50 Wolf Road
Albany, NY 12232
Attention: DOT Laboratories, Soils Engineering Laboratory Supervisor

B. Zoning

Commercial

II. GAUGE DESCRIPTION

A. Troxler Surface Moisture-Density Gauge, Model No. 3411-B.

Radiological Specification

Gamma Source	-	8 ±1 mCi Cesium-137 TEL A-102112
Neutron Source	-	40±10% mCi Americium-241: Beryllium with 70,000 N/Sec yield, TEL A-102451
Source Form	-	Stainless steel doubly encapsulated.
Shielding	-	Tungsten and lead.
Source Rod Containment	-	Stainless steel, 55c Rockwell hardness.
Source Seal Approval for Domestic and International Shipment	-	Cs-137, Special Form Certificate GB: SFC 140. Am-241, Special Form Certificate GB: SFC 7.

B. Campbell Pacific Nuclear Portaprobe Percent Test Nuclear Soil Gauge, Model MC-2

Radiological Specification

Gamma Source	-	Cesium/137, CPN-131 Sealed Capsule, 10 mCi/capsule/4caps
Neutron Source	-	Americium/241, CPN-131 Sealed Capsule, 50 mCi/capsule/4 caps

III. STORAGE FACILITY

A. Permanent Location

1. The building is rigidly constructed, with adequate fire safety equipment and located in a commercially zoned area.
2. The gauges are stored in a separate room. The storage cabinet is located in a remote area where only occasional personnel use is anticipated. The area is kept locked and secured at all times with keys available only to licensed operators. In addition, the gauge's source rod is kept locked when not in use.
3. The room and the cabinet both are posted with appropriate radiation warning signs.
4. The building is locked and secured during non-working hours. Security guards will make rounds to check on above.
5. The facility meets with the approval of the Radiation Safety Officer.
6. The Campus Manager has the name, address, and phone number of the Radiation Safety Officer and his designated alternate who can be contacted in case of emergency.
7. The facility shall always be subject to inspection for compliance to these requirements.

B. Temporary Location

1. The building shall be rigidly constructed, with adequate fire safety equipment and located in a commercially zoned area.
2. The gauge(s) will be stored in a separate room, if possible. If this is not possible, the storage cabinet will be located in a remote area where only occasional personnel use is anticipated. In either case, the area will be kept locked and secured at all times with keys available only to licensed operators. In addition, the gauge's source rod is kept locked when not in use.
3. The room cabinet both will be posted with appropriate radiation warning signs.
4. The building will be locked and secured during non-working hours. If available, security guards will make rounds to check on above.
5. The facility will be inspected by and meet with the approval of the Radiation Safety Officer.
6. The building superintendent will be given the name, address and phone number of the Radiation Safety Officer and his designated alternate who can be contacted in case of emergency.
7. The facility shall always be subject to inspection for compliance to these requirements.

C. Storage in Vehicle

1. If the gauge is going to be stored overnight in vehicle the following conditions must be met:
   a. Prior to approval by the Radiation Safety Officer will be necessary.
   b. Vehicle must be locked and display the appropriate radiation warning signs.
   c. Vehicle must be kept at same location as where certified operator is staying. In addition, the vehicle must be parked in a well-lighted area for security reasons.
   d. At no time shall the gauge be taken inside a private residence or a motel room overnight.
2. If an accident occurs with vehicle follow conditions under Emergency Procedures.

IV. UNAUTHORIZED USE OF GAUGE

A. Only certified operators have keys for access to gauges.
B. The building is locked and secured during non-working hours. If available, security guards will make rounds.
C. The storage area, where gauges are located, is kept locked at all times.

V. FIRE PROTECTION

A. Building is of non-combustible construction.
B. The walls are concrete covered with fireproof tiles.
C. The ceiling and floors are reinforced concrete.
D. Fire extinguishers are mounted on nearby walls.
E. Building conforms to existing State regulations and Codes.

VI. OPERATOR'S QUALIFICATIONS

A. To become a certified operator, the individual must have satisfactorily completed the operator's course given by the manufacturer for the gauge he will be using. The manufacturer will train operators on the following topics:
    1. Nature of sources.
    2. Operation of equipment.
    3. Safety procedures for normal operation.
    4. Emergency procedures.
    5. Packaging and shipping of radiation.

In addition, the Radiation Safety Officer will train operators on the following:

1. Radiation exposure factors.
2. Occupational dose limits.
3. Radiation monitoring.
4. Film badge usage.
5. Reporting malfunction or problems.
6. Emergency procedures.

B. Individual must be an employee of the Main Office or the Regional Geotechnical organization, to be certified to operate gauges licensed under the Geotechnical Engineering Bureau.
C. The Radiation Safety Officer must meet the above two items (A & B) and in addition be a member of the Main Office staff.
D. The manufacturer will issue a certificate of training upon completion of the course to operators and Radiation Safety Officer.

VII. EXPOSURE MONITORING PROCEDURES

A. Each certified operator is provided with a monitoring film badge which is to be submitted to Radiation Detection Co., Sunnyvale, California or any Company having an approved State Contract for readout of gamma and neutron dosage each month.
B. A record of exposure information is maintained and monitored by the Radiation Safety Officer.
C. Under average conditions, at a distance of 2 ft. (0.6 m) from gauge a full-time operator working a 40 hour week can expect to receive about 20 MREM's per week (gamma and neutron) or 260 MREM's (gamma and neutron) per 13 weeks for his whole body. This dose is well within the limits prescribed in Code Rule 38 under Section 38.21.
D. Dose to general public is zero due to the following:
    1. Only certified operators wearing film badge are allowed where gauge is stored.
    2. Under field conditions no one except gauge operator is allowed within 15 ft. (4.5 m) of gauge.

VIII. OPERATING AND EMERGENCY PROCEDURES

A. <u>Operating Procedures.</u>

1. Operator(s) are required to wear a film badge when using or transporting gauge.
2. Keep the source in the "safe" or stored position when not in use (this includes from one test location to another).
3. While exposure dose levels are well within limits for radiation workers, never expose yourself to the bare source without sufficient justification for the additional dose.
4. Keep all unauthorized persons out of operating area. Suggested distance 15 ft. (4.5 m).
5. Maintain security of the instrument at all times. The source lock shall be in place any time the gauge is not in use.
6. The gauge shall be kept in carrying case (shipping case – DOT 7A, Type A, Yellow II Label, 0.1 Transport Index) with source rod locked while in transit. It must be transported only by a certified operator in an approved vehicle.
7. The gauge while being transported in a vehicle shall be located in an area as far away from any person(s) as possible (trunk of sedan, back of station or suburban).
8. The vehicle, transporting the gauge, must be kept locked when unoccupied.
9. If an accident occurs with vehicle while transporting gauge, follow conditions under Emergency Procedures.

B. <u>Emergency Procedures.</u>

1. In the event of physical damage to the gauge, a 15 ft. (4.5 m) radius area will be secured by means of rope, stakes and signs. This will be maintained until the extent of source damage (if any) is determined. If a vehicle is involved, it will be stopped and remain stopped until the extent of contamination hazard (if any) is determined. If visual examination of the instrument and source indicate damage to the sources, involving fracture of the weld, the Radiation Safety Officer, appropriate authorities and Troxler Electronic Laboratories Inc., or Campbell Pacific Nuclear Corporation will be notified for further instruction.

2. Immediate telephone notification will be made to the following in the event of accident or the loss of a gauge, whether accidental or due to theft:
   a. Radiation Safety Officer.
   b. Area State Police.
   c. Troxler Electronic Laboratories or Campbell Pacific Nuclear Corporation (if necessary).
3. A utilization log book is kept with gauge at all times. On the inside cover are the phone numbers to call in the event of an accident.
4. In case of fire, security guards would immediately notify the Campus Manager or Building Superintendent who would then notify Radiation Safety Officer or his designated alternate for direction.

IX. EQUIPMENT AND LICENSING INFORMATION NECESSARY FOR OPERATION (ALL ITEMS LISTED BELOW ARE TO BE KEPT WITH GAUGE AT ALL TIMES).

A. <u>Utilization Log Book – information recorded is as follows:</u>
1. Important phone numbers in the event of malfunction or accident with gauge.
2. Model and serial number
3. Date and time of day gauge is removed from and returned to storage.
4. Name of operator.
5. Destination.
6. Signature of operator.
7. Standard counts of gauge.

B. <u>Folder – information recorded is as follows:</u>
1. Copy of license issued by Department of Labor with amendments.
2. Personal identification.
3. Copy of Code Rule 38.
4. Notices of radioactive materials.
5. Gauge operator's manual.

C. <u>Rope, stakes, and warning signs.</u>

X. INVENTORY CONTROL

A. A record is kept by Radiation Safety Officer showing where gauges are located at all times.
B. Every 6 months, a thorough inventory is done (this coincides with leak testing schedule) to check gauges for usage and condition.

XI. SERVICE

A. All service to gauges will be done by Troxler Electronics Laboratories or Campbell Pacific Nuclear Corporation.
B. At "no time" will any service be done by the operator.

XII. LEAK TEST

A. The leak test is administered and monitored by the Radiation Safety Officer on a 6 month basis.
B. The testing is done using an approved kit supplied by Troxler Electronics Laboratories, Campbell Pacific Nuclear Corporation or any company licensed to provide the service.
C. A test paper supplied with the kit shall be coated with soap solution prior to wiping the tow radioactive sources in the gauge. The test paper is then placed in plastic envelopes on which the following information is recorded:
    1. Company name.
    2. Address.
    3. Gauge Model.
    4. Gauge Serial No.
    5. Source Serial No.
    6. Date of test.
D. The plastic envelope is placed in a shipping envelope along with leak test analysis form which also contains the above information which is then shipped to Troxler Electronic Laboratories, Inc. or to any company which is licensed to provide such services, for analysis.

XIII. DISPOSAL

A. Any gauge which is no longer of any use to the Geotechnical Engineering Bureau will be returned to the manufacturer for disposal.